Information on determination of code numbers

In 1982 an Executive Order on determination of code numbers and the connected Executive Order on work with code numbered products were published for the first time.

In 1993 the Executive Orders were reviewed (Danish Working Environment Services Executive Orders no. 301 and 302 both dated the 13th of May 1993). Besides paint and lacquer the Executive Orders cover printing inks, adhesives and sealants, paint strippers as well as products for cleaning and degreasing, when these products are used in connexion with the products otherwise covered by the Executive Order.

For the products, which are covered by the Executive Orders, importers, manufacturers or distributors shall determine a code number and the Code number shall be stated conspicuously on the packaging or in any other way notified in writing to the recipient. The statement can be given on the label as it is recommended by FDLF.

Code numbers of products shall together with the safety data sheets and any other relevant information be included in the assessment of the health risks associated with the products and will make it easier to choose the less harmful products in a given situation.

The code number of a product represents the minimum safety precautions to be taken in certain work situations. When determining the Code number all components of the product must be taken into consideration. The higher the numbers the higher is the need for safety precautions.

The code number consists of two numbers joined with a hyphen.

The number in front of the hyphen (00-, 0-, 1-, 2-, 3-, 4-, 5-) take into account the health risks from inhalations of vapours and therefore represents the safety precautions which as a minimum have to be taken against the inhalation of vapours from the volatile substances of the products.

The number after the hyphen (-1, -2, -3, -4, -5, -6) take into account the safety precautions to be taken if there is a risk that skin, and eyes will come into direct contact with the product also due to a spray mist or if there is a risk of inhalation of drops or dust from a spray mist, or dusts from the product.

Determination of the code number

To be able to determine a code number for a substance or a product it is necessary to be in possession of the following documents in valid versions:

- Arbejdstilsynets bekendtgørelse nr. 301 af 13. maj 1993 om fastsættelse af kodenumre (Executive Order no. 301 of the 13th of May 1993 on the determination of code numbers, The Danish Working Environment Service)
- Bekendtgørelse af Listen over farlige stoffer (The executive order on the list of dangerous substances)
To determine the number in front of the hyphen it is necessary to calculate MAL. All volatile substances in the product are taken into account when calculating MAL.

MAL is calculated using the following formula:

\[
MAL = d \times (\sum P(i) \times MAL\text{-factor} (i))
\]

Where
- \(d\) is the density of the product measured in kg per litre
- \(x\) is a multiplication sign
- \(\Sigma\) is a summation sign
- \(P(i)\) is the percentage by weight at which the individual substance is present in the product, and
- \(MAL\text{-factor} (i)\) is the MAL-factor of the individual substance

MAL is measured in m\(^3\) air per litre product.

The number in front of the hyphen can be read in the table below:

<table>
<thead>
<tr>
<th>MAL Range</th>
<th>Number in Front of Hyphen</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 m(^3)/l</td>
<td>00-</td>
</tr>
<tr>
<td>30 m(^3)/l</td>
<td>0-</td>
</tr>
<tr>
<td>100 m(^3)/l</td>
<td>1-</td>
</tr>
<tr>
<td>400 m(^3)/l</td>
<td>2-</td>
</tr>
<tr>
<td>800 m(^3)/l</td>
<td>3-</td>
</tr>
<tr>
<td>1600 m(^3)/l</td>
<td>4-</td>
</tr>
<tr>
<td>3200 m(^3)/l</td>
<td>5-</td>
</tr>
</tbody>
</table>

Determination of the MAL-factor.

Information on determination of code numbers, October 2004
Before MAL can be calculated the MAL-factor need to be appointed for each substance in the product.

MAL-factors for substances listed in sub-annex 1

In sub-annex 1 to the Executive order no. 301 the MAL factors for many substances have been appointed already and they must be used.

MAL-factors for substances not listed in sub-annex 1

If a substance is not listed in sub-annex 1 the MAL-factor has to be determined as indicated below under 1, 2, 3 or 4:

1) Substances listed in the current TLV list with indication of both mg/m$^3$ and ppm

   \[ \text{MAL-faktor} = \frac{k \times 10,000 \text{ m}^3 \text{ air} / 10 \text{ g of substance}}{\text{TLV}} \]

   where k has been fixed at 2 and TLV is given in mg/m$^3$.

2) For substances where TLV is only given in mg/m$^3$, the MAL-factor (i) is fixed at 0, as such substances are not volatile.

3) Substances which are not listed in the TLV list but can be classified as dangerous according to the provisions laid down by the Executive Order on the list of dangerous substances are given a MAL-factor in accordance with Sub-annex 2A, "MAL-factor".

4) Substances which are not listed in the TLV list and which are not classified as dangerous in accordance with the Executive Order on the list of dangerous substances are given a MAL-factor in accordance with Sub-annex 2B, “MAL-factor”. When absurdities are discovered the Danish Working Environment Service can be contacted in order to get a administrative MAL-factor appointed (see item 5 below).

5) The Danish Working Environmental Service can appoint a MAL-factor for a substance from information received on the substance. These MAL-factors will appear on the Danish Working Environment Services’ list of administratively appointed MAL-factors etc. (The list can be achieved by contacting Mrs. Lillian Petersen, the Danish Working Environment Service).

6) In addition to the administrative list there are several other notes from the Danish Working Environment Service, which can be taken into account when calculating a Code number. The notes in question are "note on MAL-factors for crude oil distillates dated the 29th of January 1996” and “Letter from the Danish Working Environment Service concerning the lower limit for including impurities in the determining of code numbers dated the 20th of February 1997”
**Number after the Hyphen.**

The number after the hyphen is determined taking into account all components, which make up the product. Impurities from the raw materials as well as residual monomers shall be included in the same way as other substances.

In sub-annex 1 a number after the hyphen and a percentage by weight limit for the number to be used are appointed for various substances.

The number after the hyphen for substances, which are not in sub-annex 1, but can be classified as dangerous according to the provisions laid down by the Ministry of Environment is to be assigned a number after the hyphen in accordance with sub-annex 3A. All remaining substances are to be assigned –1 according to sub-annex 3B.

When the number after the hyphen is appointed for all substances in a preparation, the number after the hyphen for the preparation is to be found according to the following principles:

- If a preparation contains several substances each of which would place the preparation in different groups, the preparation shall be placed in the group with the highest number after the hyphen.

- If a preparation contains several substances, which belong to the same group but with percentages by weight below their respective percentage by weight limit, the preparation shall be given the number after the hyphen of the group in question, if the following formula is met:

\[
\frac{P(i)}{\sum G(i)} \geq 1
\]

where \(P(i)\) is the percentage by weight at which the individual substance is present in the preparation, and \(G(i)\) is the percentage by weight limit indicated for the substance in sub-annex 1 or sub-annex 2 (A+B).

This means that the calculation is to be made as follows:

\[\frac{P(i)}{G(i)}\] for each substance must be added (\(\sum\)). If the resulting sum is greater than or equal to 1, the preparation is given the number of the group concerned. If, on the other hand, the sum is smaller than 1, the preparation is given the number –1.

The fact that in all cases the abovementioned addition must be made in accordance with the mentioned formula may cause absurdities. For example in the EPA’s classification order, where consideration has been taken into the fact that it is beside the point to add R43-substances (substances with a sensitising effect). This means that here each substance must be considered by itself. The code number system does not take this into consideration. Here all substances are added up if they belong to the same group, whether it is relevant or not. In this example it means that a product can have a –5 because of a sensitising effect even if the product is not classified with Xi;R43.

Besides the following rules apply:
- If a substance is marked with H in the Danish Working Environment Service’s list of limit values and is a constituent part of the product in a concentration of 1% or more, the product’s figure after the hyphen must be 3, unless it has been given a different figure in sub-annex 1.

- If a substance is included in the Danish Working Environment Service’s list of carcinogenic substances and is a constituent part of the product in a concentration of 0.1% or more the product’s figure after the hyphen must be –6.

Besides, there are special circumstances, for example contribution to MAL from impurities and residual monomers, dual component products etc.

**Dual component products**

For ready-mixed dual component isocyanate products a spontaneous reaction of the isocyanate-monomer is anticipated, i.e. the concentration of the monomer and the contribution to the MAL-figure is fixed at 0.

For ready-mixed dual component epoxy products no spontaneous reaction of the monomer is anticipated, and it is therefore included 100% by the determination of the code number.

For both isocyanate- and epoxy products the oligomers/prepolymers are included 100% by the determination of the code number for ready-mixtures.

**Products containing ammonia and amines (see the association’s information on ammonia and amines)**

**Ammonia**

For paint and varnishes based on acrylics there is by a pH <9 calculated with a maximum evaporation of 0.15% NH₃ when determining the MAL-figure irrespective of added quantity in the product.

**Amines – AMP**

By a pH <9 AMP is not considered by the determination of the MAL-figure.

**Products containing respirable silicon oxide (quarts)**

When calculating the code number the values are used as indicated in the Danish Working Environment Service’s list of administratively appointed MAL-factors etc., also even if quarts is not respirable in paint.

**Products containing acrylates in UV-curing products.**
According to a recommendation from the association (Recommendation concerning acrylates and labelling of acrylates in UV-curing products, June 1999) products containing acrylates are generally given the code number 00-5. However, the code number 00-1 can be used in connection with UV-curing water-borne acrylates, when according to the suppliers they do not contain monomers and the equivalent weight is above 500.